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Sanitized Copy Approved for Release 2011/07/12 : CIA-RDP80-00809A000700240169-7

ATTEMPTS TO ACHIEVE BETTER UTILIZATION OF SLOVAK POWER RESOURCES

Ekonomicky Casopis, Vol II, No 2
Bratislava, Feb 1954

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The production of electric power in Czechoslovakia has tripled compared with the prewar period. During 1937, annual power production was 4.1 billion kilowatt-hours; by 1953, production amounted to 12.5 billion kilowatt-hours. In Slovakia, power production in 1953 amounted to three times that of the prewar period.

Despite the substantial increase, a gap still existed between production and demand. The development of a power base lagged behind the rapid growth of industrial production. The lag in the development of power, combined with inadequate agricultural, fuel, and ore production, creates one of the greatest obstacles to the development of the national economy after the completion of the First Five-Year Plan.

The disproportion caused by the lag in the development of electric power is all the more important because of the part played by electricity in daily life.

The power shortage causes much economic damage through unscheduled work stoppages which adversely affect plan fulfillment, production costs, and technological processes, and result in heavy damage to raw materials. Power shutdowns are also distasteful to the consumer.

This article will point out Slovakia's experiences in surmounting power production and consumption difficulties during the last years of the Five-Year Plan. The experiences of power plant employees in preventing breakdowns in equipment, reducing inspection periods, regulating the use of power, making more efficient use of power plants, etc. point to the great economic significance of the struggle for utilization of the production reserve; experiences with the institution of electric power consumption diagrams and consumption norms in plants show further possibilities for conserving electric power.

The struggle against the lag in the development of an electric power base for the Czechoslovak economy was begun by the party and government in 1951. The increased tasks of the Five-Year Plan, published during the February 1951 session of the Central Committee of the KSC, were meant to remove and mitigate certain disproportions blocking expansion of the power base. Since that time, more rapid development of industrial production was ensured, but, as stated in a government proclamation dated 15 September 1953, the increased expansion of raw material production and of the electric power base was not attained.

The industrialization of Slovakia, especially during the Five-Year Plan, has meant a rapid growth of industrial production, particularly production of commodities requiring exceptionally large amounts of electric power in their manufacture. For example, Slovak aluminum production requires the entire electric power output of one large power plant. The operation of large, new engineering works, chemical plants, and other industries has also meant a substantial increase in the consumption of electric power in Slovakia.

During the Five-Year Plan, the needs of large consumers, especially of industry, have increased 180 percent. This includes only consumption from the public power network, and does not include the increased output of enterprise

power plants. Small-scale consumption of electric power, represented primarily by domestic consumption and small-scale consumption in stores, small production shops, communal services, schools, and similar establishments, has increased 125 percent during the Five-Year Plan.

In Slovakia, the production of electric power was not able to keep up with the rapid increase in consumption because of the lag in the construction of new power plants. Slovakia's difficulties in supplying electric power began during the Two-Year Plan. The disproportion between production and consumption has steadily increased and supply difficulties were very serious during the final years of the Five-Year Plan. Transmission of electric power from Moravia to Slovakia, which increased sixfold in 1953, as compared with 1949, was the sole factor permitting the mastering of these difficulties without threatening production.

No record has been compiled of the damage to Slovakia's national economy resulting from the power shortage. However, the situation can be readily appreciated when one considers that during the last 2 years of the Five-Year Plan, power plants failed to supply about 40 million kilowatt-hours of electric power due to power failures.

Reductions in the supply of power and power failures slowed down plan fulfillment, affected the production of consumer goods, caused workers and machines to be idle for long periods of time, resulted in losses of wages, and caused many other types of damage.

Power failures also affect agriculture. Certain obeces were frequently without electric power for hours and even days and many agricultural operations had to be performed by hand rather than mechanically. The shortage of power primarily affected state farms and JRDs.

Frequent power failures also had an adverse effect on the living standard of the workers, who have increased consumption through the use of larger numbers of radios, electric washers, refrigerators, electric irons, and other power-consuming appliances.

In December 1951, the government adopted a resolution calling for improved operation of power plants and better distribution, and the construction of new power plants and distribution centers.

The government resolution is divided into two parts. The first part covers provisions for the improvement of power production and the regulation of consumption; the second part deals with the guarantees of power plant construction.

The disproportion resulting from the lag in the power base may be corrected only through intensive construction on new thermal and hydrcelectric plants and power distribution centers, which will permit the transmission of electric power over long distances. The Five-Year Plan contained the necessary funds for this construction, but construction delays have slowed the opening of new power plants. The government resolution also contained a provision for an investigation of power requirements, on the basis of which a plan for new power plant construction could be drawn up for the period 1953-1955.

In addition to the loss of electric power resulting from a lag in the construction of new power plants, power shortages in existing plants, resulting from numerous breakdowns in equipment, also caused a serious disproportion between the consumption and production of electric power. The power lost through breakdowns in equipment could have improved the power situation and prevented a great deal of damage.

The construction of new power plants remains the basic problem, because reserves in production and the regulation of consumption have their limits and do not suffice in resolving the disproportion between the production and consumption of electric power. The full utilization of these reserves must, however, become a permanent manifestation in the power plants and in the consumption of electric power.

The government resolution of December 1951 divides these precautions into several groups. They concern precautions against failures in power plants and distribution nets, prevention of a disparity in electric power installations, speeding up of repairs, increased economization, increased utilization of thermal electric plants, regulation of consumption of electric power and its economical use, and improvement in the operation of enterprise power plants. The resolution is also concerned with the over-all improvement of work in the field of electric power, especially with the improvement of party and mass political work and the proper distribution of cadres. The resolution also cites the high incidence of breakdowns in Slovak power plants and distribution centers as the main reason for the undependable supply of electric power. In 1951, Slovak power plants had 253 breakdowns, which caused a drop in production of 73,448,000 kilowatt-hours. Ultrahigh-voltage distribution stations, on which large areas of the country are dependent, had 50 breakdowns during 1951, and high-voltage distribution stations had 925 breakdowns. Reasons for the breakdowns in power plant equipment and distribution stations may be divided into two main groups: those resulting from faulty work of the employees, and those resulting from defects in equipment.

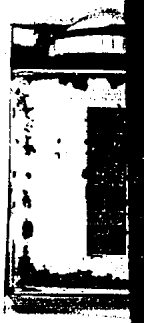
The number of breakdowns dropped to 177 in 1952, and the resulting losses of power were reduced to 60,545,000 kilowatt-hours. During this period, ultrahigh-voltage distribution stations had only 11 breakdowns, and high-voltage distribution stations had only 464 breakdowns.

In 1953, there were only 113 breakdowns, resulting in a loss of 69,587,000 kilowatt-hours; ultrahigh-voltage distribution stations had only three breakdowns, and high-voltage distribution stations had 238, or only one half the number they had in 1952.

Between 1951 and 1953, the decline in breakdowns was as follows (in percent): in the production of electric power, 55; in high-voltage transmission, 74; and in ultrahigh-voltage transmission, 94. Less favorable, however, are the results achieved in attempting to reduce the losses of power caused by breakdowns.

As a result of reducing the number of breakdowns in power production to 45 percent in 2 years, losses of power in 1952 were reduced to 85 percent [compared to 1951], but in 1953, losses had increased to 95 percent of the 1951 level. This shows that minor breakdowns of a shorter duration had been successfully prevented, although they do not account for a very big drop in power losses. The serious breakdowns of long duration are the ones which deprive the economy of millions of kilowatt-hours of electricity. In 1953, for instance, serious breakdowns occurred in two thermal power plants and one hydroelectric power plant and resulted in a combined loss of 52 million kilowatt-hours of electric power. These three major breakdowns were on new equipment [recently] delivered to the power plants by the engineering industry.

From the above, it can be seen that defective equipment shipped to power plants by the engineering industry presents a serious problem. Major breakdowns of new equipment can cause months of partial idleness in industry and elsewhere, and deprive the national economy of its share of power. Serious damage and breakdowns can also be caused by employees who are untrained, unattentive, or lacking in responsibility. In one instance, a 34-megawatt turbogenerator was put out of order, along with three other pieces of equipment, because of lack of technical knowledge on the part of mechanics during testing.



The way to fulfill the government resolution on the prevention of breakdowns in electric power plants and distribution stations is by making certain that employees acquire a thorough technical knowledge, hiring them for their careful handling of machinery, interesting them materially in working without interruption, and devoting attention to outstanding organizational work and a high level of technology. Also, electrical equipment from the engineering plants should be of high quality and without defects which could cause serious breakdowns beyond the [repair] capabilities of the power plant employees.

Another factor to which attention was called by the government resolution of December 1951 was the disparity between capacity and production in electric power installations. The installed capacity of some electric power plants is higher than their output, because inadequate boiler capacity does not permit full utilization of the installed capacity. In 1952, the electric power network of Slovakia realized a gain of 9 megawatts in standby output through reconstruction of certain boilers.

Timely and good repair and inspection of equipment is important for the proper operation of an electric power plant. The tense situation in the electric power supply system and the frequent breakdowns in power plants prevent the execution of planned repairs and inspections, which makes conditions even worse. General repairs are planned for low-load periods. High-water levels are utilized for the full operations of hydroelectric power plants and for the relief and general repair of thermal power plants. General repairs of individual power plants must be carefully coordinated so that the total loss of production does not surpass the plan or cause disruptions in the power supply. General repairs have at times been put off so long that they had to be carried out during the winter, when the loss of power is the most serious.

The importance of reducing the time required to perform general repairs is best illustrated by example. If the general repair time on a 20-megawatt turbogenerator can be reduced by 5 days, the national economy gains about 2 million kilowatt-hours of electric power. It is not difficult to see what a reduction in the time required to perform general repairs in the entire electric power system would mean to the economy. In 1952, Slovak electric power plants had planned 1,835 days for general repairs, but because of better organization, socialist competition, and other factors, the repairs were carried out in 1,698 days, a reduction of 137 days. In 1953, only 1,377 days were allotted for general repairs, which was further reduced to 1,182 days, representing a gain of 195 days.

The government resolution also called for greater economy in the operation of power plants. In an effort to reduce the specific consumption of fuel per kilowatt-hour of power produced, many technical measures were adopted. These included increased care in the servicing of boilers, better training of personnel, control of the accuracy of thermal processes, implementation of correct fuel consumption norms, and payment of bonuses for fuel savings. The objective was to reduce fuel consumption by 5 percent.

Every percentage point of fuel saved in Slovak power plants represents thousands of tons of coal. For example, if a thermal power plant with an installed capacity of 30 megawatts reduces its specific fuel consumption 5 percent per kilowatt-hour of power produced, it will save about 6,000 tons of fuel annually.

The results of the struggle to reduce specific consumption of coal per kilowatt-hour of power produced may be illustrated graphically by studying the figures of three basic Slovak electric power plants, in Krompachy, Handlova, and Bratislava.

The table gives specific consumption of fuel (in kilocalories) per kilowatt-hour of power produced by the above plants for each year of the Five-Year Plan:

Power Plant	1948	1949	1950	1951	1952	1953
Krompachy	4,320	4,400	4,288	3,970	3,837	3,879
Handlova	4,250	4,236	4,549	4,428	4,820	4,530
Bratislava II	4,367	4,266	4,205	4,123	3,945	3,961

Not one of the plants achieved the 5 percent reduction in fuel consumption (from 1951). In Handlova, consumption actually increased, compared to 1948, and it fluctuated greatly over the years.

All of the safeguards and resolutions concerning improvement of operations in thermal power plants are also applicable to hydroelectric power plants, which can also help reduce the shortage of electric power.

The cooperation of enterprise power plants with the electric power network significantly alleviated the difficulties of the electric power supply system in Slovakia. In 1952, a thorough survey of all power producing facilities was made, to ascertain which facilities did not supply power to the public network, or supplied only small amounts, compared with their production capacities. The primary objective at that time was to obtain help during the peak-load period, especially during the evening.

The serious power shortage required the mobilization of older, and sometimes comparatively small, unproductive units in which the cost of production per kilowatt-hour was high. However, compared with the damage resulting from power failures, the losses resulting from greater production costs in older power producing units were deemed unimportant.

This is also true of the power plants' own auxiliary production sources which must be in operation during peak loads, and whose production costs are many times greater than those of a large modern power plant. For example, in 1953, the production of one kilowatt-hour of power by [auxiliary?] diesel aggregates in Slovak power plants was 5.7 times more expensive than the average cost of producing one kilowatt-hour of power in a thermal power plant. In spite of this, diesel aggregates must be used during the power shortage, especially during peak-load periods; in fact, this type of production increases from year to year. In 1953, diesel aggregates produced twice as much power as they did in 1951, and three times more than in 1948. This situation can be remedied only by adequate production in new capacities, so that diesel aggregates, as well as other less economical sources, may be retained only as reserves in the event of a breakdown.

Power supplied to the public network by enterprise power plants has not reached the ultimate limit of its potential. Enterprise power plants contribute about 4 percent of the daily maximum power production flowing into the network. Some efficient enterprise power plants (for example, Rybarpole) are not in operation because of a shortage of coal, but other, antiquated, power plants of the Ministry of Fuel and Power, with an inferior production and a greater consumption of fuel per kilowatt-hour of power produced are in operation. This represents waste of coal and calls for a solution; full utilization of modern enterprise power plants would be best safeguarded by their integration under the jurisdiction of the Ministry of Fuel and Power.

Safeguarding the flow of electric power involves entirely different problems from those of supplying raw materials, fuels, and other commodities, since electric power cannot be stored. Therefore, power plants must produce the amount of electricity which the consumer needs at any particular time. Power plants must constantly adjust to the load changes in the distribution network.

The load changes in accordance with the amount of power used by consumers, and consumption changes considerably during the course of one day; in the morning and evening it is high, while in the afternoon and especially at night, it is low. The concentration of high consumption during a certain period of the day brings on a peak load at the power plant.

During a peak-load period, power producing equipment operates at full capacity. It is possible for the load to surpass the limits of production, in which case the power plants must reduce the load and cut off a part of the supply. Otherwise the equipment in the power plants would be overloaded and the frequency of the current would drop. This would constitute a serious threat to equipment in power plants and industry and would result in a decline in the productivity of work in enterprises receiving supplies of inferior power. The government resolution specifically forbids the distribution of below-standard electric power, and permits a maximum variation of only 0.5 oscillation per second.

During light-load periods, especially in the afternoon and at night, the power producing equipment is again insufficiently utilized. Power plants frequently have insufficient production capacities to cover peak-load requirements, while they enjoy an unutilized production reserve during light-load periods.

Equalizing consumption and staggering power plant loads so as to obtain uniformity over a 24-hour period are of exceptionally great importance, because a fuller utilization of power plant equipment and a greater production of power are permitted. Consequently, regulatory safeguards for coordinating power consumption with power production potentials are necessary.

In 1952, the Ministry of Fuel and Power issued directives on the conditions governing consumption of electric power and rules for regulating consumption as well as the economic use of electric power. Accordingly, large consumers could use only the power authorized for them within the scope of a previously approved consumption diagram.

The consumption diagram determines the amount of power an enterprise may use during certain hours of a 24-hour period. The distribution station is authorized to cut off the flow of power to the consumer who exceeds this allocation. In drawing up consumption diagrams, all plants are obliged to shift certain processes which use large amounts of power, and even entire shifts, to periods when the electric power grid is not overburdened, if such action is deemed necessary to ensure a continuous supply of electric power. The ministry also issued directives regulating consumption during the summer and winter seasons. For example, enterprises with one shift may use electric power in the morning during the first week, in the afternoon during the second week, and at night during the third week. Plants with two shifts must work one week with a morning and afternoon shift, the second week with an afternoon and night shift, and the third week with a night and morning shift. The realization of these safeguards ran into great difficulties.

It became necessary to adjust enterprise work periods according to the availability of electric power and to convince the workers of the inevitability of night shifts. The staggering of shifts also required a substantial change in the transportation of employees to work. This was not easy, but the results attained attest to the ability and self-sacrifice of Slovak workers. Two 24-hour

periods (8 November 1950 and 5 November 1953) have been selected for a comparison of the loads on the power system in Slovakia. Both days were short and electric light had to be used early in the evening, and enterprises were operating at full speed to fulfill annual production plans.

In 1950, great fluctuations in consumption and an unequal distribution of the load were evident; during the night, lights were not being used and only enterprises with three shifts were working. After 0500 hours, the load began to rise very sharply and reached its peak at 0700 hours, after which time the load began to drop progressively. During the morning the load remained at a steady high, but after 1200 hours it began to drop, and reached its lowest daily point at 1400 hours, when the first shift ended its work. Thereafter, consumption rose again for the second shift because of the progressively increasing use of lights. The evening peak was reached at 1730 hours, which represented the daily maximum consumption, followed by a progressive drop until the nightly nadir.

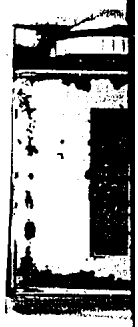
The minimum night consumption of electric power was only about one half of the daytime consumption; similarly, the afternoon consumption was only about 70 percent of the daytime maximum. The inadequate utilization of the power producing potential can be accurately shown by the index for utilization of the daily maximum consumption, obtained by dividing the number of kilowatt-hours supplied by the daily maximum, in kilowatts. On 8 November 1950, maximum utilization reached 18.3 hours, or about 76 percent of 24 hours.

On 5 November 1953, a much smaller fluctuation was evident, with the nightly and afternoon drops more moderate and the morning and evening peaks not rising as sharply as in 1950. On that day, the minimum night consumption was about 82 percent of the maximum daytime consumption and afternoon consumption remained at about 94 percent of the maximum daily consumption. Maximum utilization reached 21.6 hours, or about 90 percent of 24 hours. Thus the daily maximum was utilized 18 percent better than on 8 November 1950.

However, on 5 November 1953, various power shutdowns resulted in a 7.6-percent drop in power supplied to consumers. Had there been no power shutdowns, the morning and evening peaks would have increased and the daily maximum load would have been greater.

This fact tends to show that although regulation of consumption does help to disperse peak loads, it has its limits and after a certain point can no longer afford large reserves. Power for which no production potential exists in power plants simply can not be produced, despite additional regulatory measures. Under ideal conditions, the daily maximum utilization on 5 November 1953 could reach 23 1/2 hours, or 98 percent of 24 hours. This is technically an unattainable state. In addition, electric power plants need a certain amount of relief during the night to make planned repairs. Without a scheduled drop in the nighttime load it would possibly be necessary to shut down power plants at the slightest sign of trouble.

Practice has shown that, in certain cases, shifting to nighttime production does not result in any great improvement in the power situation, while it does create serious problems. Certain enterprises have employed youths on night shifts, even though this practice is forbidden. In the attempt to fulfill the plan during the period of available power, youths have often applied for night shift duty. Finally, youths were barred from night work even though they requested such work. A similar problem arose in enterprises which require a small amount of electric power but have a large number of employees. In such cases, a large number of employees had to work the night shift to take advantage of the low-peak period in the supply of power. This resulted in great difficulties, especially for the women. The directives for the winter of 1952-1953 release enterprises who employ more than 50 percent women and consume less than 130 watts per worker from the obligation of working a night shift.



The disadvantage of shifting to night work became evident in certain types of industry, such as creameries and the film industry, and an exception to night consumption of electric power was also granted. Power distribution stations have a great responsibility in instituting the regulatory safeguards. They must make every effort to make the safeguards adequate and ensure that the sacrifices required are worth the gains.

Enterprises must also realize that the regulation of electric power consumption is not a temporary measure but rather a permanent phenomenon of the national economy. The tendency of certain enterprises to escape night shifts and their refusal to adhere to the consumption diagrams find them in error when the power situation improves even slightly.

Enterprises in Slovakia have gained considerable experience in the proper distribution of power consumption. Certain enterprises and even whole branches of industry utilize Soviet experiences and their consumption diagrams help to reduce the power peaks. For example, through its consumption diagrams, a whole sector of the cellulose and paper industry prevented morning and evening peaks and increased the nighttime consumption of power.

The opposite situation is true in many other enterprises. During inspections, the electric power inspection service of the Ministry of Fuel and Power discovered that one enterprise was consuming 234 kilowatts whereas it had been permitted only 171; another plant was allotted 97.5 kilowatts, but actually consumed 162 kilowatts.

Regulation of electric power consumption in Slovakia has attained noteworthy results, and the experiences gained are used to improve the present situation. The existing power plants cannot be expected to produce substantially more electric power, even with a further equalization of consumption, because their potentials are totally exhausted. The current problem is to overcome the difficulties which have appeared in enterprises where work has been divided into three shifts. Regulation of consumption must progressively acquire a character of permanency, according to the Soviet example, since the maintenance of precise regulatory measures is necessary for mastering the electric power supply situation.

One of the important regulatory measures is the prohibition against cutting in new sources of consumption without the knowledge of the Ministry of Fuel and Power and without an increase in the productivity of power plants. Adherence to this regulation is important in order to prevent an increase in the number of power failures.

The electric power industry should notify consumer enterprises 2 or 3 days in advance regarding the power situation, so that they may be prepared for any reduction in the supply of electric power.

Safeguards in the production and regulation of consumption of power have manifested themselves in Slovak thermal power plants. Since hydroelectric plants are dependent upon a supply of water, they have been disregarded here. The government resolution calls for a progressive increase in the hourly utilization of thermal electric plants in such a manner that, by 1955, the attained utilization will have reached an average of at least 4,500 hours.

The following table shows the hourly utilization of the basic thermal power plants indicated during the various years of the Five-Year Plan. The hourly utilization indicator is obtained by dividing the number of kilowatt-hours produced in any one year by the installed capacity of the plant.

Plant	1948	1949	1950	1951	1952	1953
Krompachy	3,832	4,200	4,679	3,435	5,811	6,629
Handlova	4,462	4,613	5,087	5,520	5,365	6,147
Bratislava II	2,885	3,098	4,416	4,279	5,789	6,368

As can be seen, consumption increased from year to year; the temporary drop created by breakdowns is evident only in Krompachy and Bratislava II in 1951 and in Handlova in 1952. The usual increase in utilization from 1948 until the end of the Five-Year Plan attests to the success of the power plant employees in reducing breakdowns and in speeding up general repairs; on the other hand, it shows a better equalized load, with power better utilized at night -- in other words, success in the regulation of consumption. The task of the government resolution was greatly surpassed.

A very serious and currently unfulfilled task is improvement in the conservation of electric power by enterprises. The government resolution of September 1951 called upon all ministries whose enterprises use electric power to put into effect consumption norms. Safeguards should also have been worked out for the economization of electric power consumption in the enterprises.

The Ministry of Fuel and Power issued a decree on 17 May 1952 (No 119, Uredni List) giving detailed regulations concerning economization in the use of electric power. Electric power rationing was instituted, which binds the enterprises to fulfill their plans with the allotted amount of power. An 18 December 1953 decree (No 379, Uredni List) issued by the Ministry of Fuel and Power consists of directives for the establishment of main power plants and defining their tasks.

These rules help to prevent very serious shortages in the use of electric power, and limit apparent waste. However, that is not the only concern. The lag of the fuel and power base behind the growth of other industry makes it imperative that not one kilogram of coal or one kilowatt-hour of electricity be wasted. The conservation of fuel and electric power should become one of the primary tasks of all enterprise employees.

Consumption norms are the most important means of improving economization in the use of electric power. There are great differences among the enterprises in the observance of these norms. For example, the cement factories of Slovakia use consumption norms and follow them faithfully; thus they attain the best results in Czechoslovakia in kilowatt-hour consumption per ton of cement produced. On the other hand, the food processing industry has failed to master this task to date, and is among the worst in the country in this respect. A similar situation also prevails in agriculture.

Socialist competition, personal savings, and especially intraenterprise "khozraschet" [cost accounting system] offer great possibilities to the enterprises for the conservation of electric power and coal.

The government resolution of September 1953 provided the Czechoslovak State Plan of 1954 with a directive for substantial improvement in the supply of electric power. The plan is to guarantee an adequate supply of electric power for the use of residents and for public lighting.

The ultimate solution of the disproportion between the living standard and the electric power base lies in speeding up the construction of new sources of power. However, safeguards for better utilization of existing power plants, a more equal distribution of consumption, and an improvement in the economization of electric power have already brought noteworthy results. The expansion of these safeguards and a further improvement in the results remains the real and important task of the workers of the power industry and of the enterprise workers who are the consumers of electric power.

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